REMARKS

Applicant appreciates the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Claim amendments

Applicant has cancelled claims 18-25 and 34, leaving the claims directed to the preferred embodiment of the method for cooling fluids used in an engine of a motor vehicle by a heat exchanger assembly comprising a radiator and charge air cooler. Claim 26 has been amended to recite that, in the heat exchanger assembly, 1) the upper manifold of the upper charge air cooler portion is disposed adjacent the upper end of the radiator, and receives incoming compressed charge air to the charge air cooler; 2) the lower manifold of the lower charge air cooler portion is disposed adjacent the lower end of the radiator, and exits cooled compressed charge air from the charge air cooler; 3) the lower end of the upper charge air cooler portion is in line with and opposite the upper end of the lower charge air cooler portion; and 4) the charge air cooler upper and lower portions are operatively connected by a conduit extending from the lower manifold at the lower end of the upper charge air cooler portion and around a side of the radiator, intermediate the radiator ends, to the upper manifold at the upper end of the lower charge air cooler portion.

Claim 26 has also been amended to recite that the method includes flowing the engine coolant through the radiator from the upper end to the lower end thereof, and flowing the charge air in sequence in through the upper manifold of the upper charge air

cooler portion, the tubes of the upper charge air cooler portion, the lower manifold of the upper charge air cooler portion, the conduit extending from the lower manifold of the upper charge air cooler portion and around a side of the radiator to the upper manifold of the lower charge air cooler portion, the upper manifold of the lower charge air cooler portion, the tubes of the lower charge air cooler portion, the lower manifold of the lower charge air cooler portion, and to an air intake manifold of the engine.

Support for the amendments to claim 26 are found in the drawings in Figs. 2-5 and in the specification at paragraphs 0038 to 0040.

Claim 33 has been amended to recite that the charge air cooler portions are operatively connected by conduits and the charge air flows around both sides of the radiator, intermediate the radiator ends. Support is also found in the drawings in Figs. 2-5 and in the specification at paragraphs 0038 to 0040.

New claims 35-42 track the language of claims 26-33, respectively, except they describe the charge air flow through the charge air cooler portions and the cooling air flow through the radiator and charge air cooler portions in the direction opposite that described in claims 26-33. Support is found in the specification at paragraph 0046, last sentence. No new matter has been added.

Species election

With regard to applicant's previous election the first species of Fig. 5, applicant traverses the Examiner's characterization of claim 33 as being limited to the non-elected embodiment of Fig. 9. Figs. 2-4 also describe the embodiment of Fig. 5, and Fig. 4 shows

the operative connection for the charge air flow around both sides of the radiator. As for the new claims added herein, claims 35-37 and 42 are readable on the species of Fig. 5.

Rejection on prior art

Claims 18, 19, 21, 23, 24 and 25 stand rejected under 35 USC § 103 as being obvious from EP A 0522288 in view of any one of Lambert U.S. Patent No. 6,460,610, Siler U.S. Patent No. 6,412,547 or Flessate U.S. Patent No. 4,805,693. These claims, as well as claims 26-28 stand rejected under 35 USC § 103 as being obvious from EP '288 in view of applicant's admitted prior art Fig. 1. Claims 25 and 27 stand rejected under 35 USC § 103 as being obvious from the above prior art as applied to claims 18 and 26, further in view of Schreiner U.S. Patent No. 6,196,169. Applicant respectfully traverses these rejections.

EP 0522288

EP '288 discloses a radiator/charge air intercooler assembly in which the radiator is a downflow-type unit and the intercooler is in two parts. First cooler 4 receiving the charge air is located behind the lower portion of the radiator, relative to the cooling air flow, and the second cooler 3 receiving the partially cooled charge air is located in front of the upper portion of the radiator. The significance of this arrangement is that the cooling air that cools the top portion of the radiator, where the engine coolant is hottest, must first travel through the second cooler 3, so that the air is warmed to a higher than ambient temperature.

The inlet for the charge air is at the upper end of the lower rear cooler 4, adjacent the central portion of the radiator. The connection between the two coolers is shown as

being between the bottom of the lower cooler 4, behind the radiator, and the bottom of the upper cooler 3, in front of the radiator, so that the charge air must travel a distance greater than the height of the lower cooler.

While the arrows show a general direction of charge air flow downward for the lower, rear cooler and upward for the upper, front cooler, there is no disclosure of the locations or orientations of any manifolds for the cooler. In other words, the manifolds are not disclosed as being horizontally oriented, at the upper and lower ends of the coolers, or vertically oriented, at the opposite sides of the coolers. Applicant appreciates the Examiner's comments concerning what other patents (e.g., Lambert, Siler and Flessate) show as possible manifold arrangements for other types of charge air coolers, the point remains that EP '288 makes no disclosure of the manifold or tube arrangement for its intercooler units.

Other cited art

Lambert, Siler and Flessate disclose single unit charge air coolers, and do not disclose the combination of separate upper and lower charge air cooler portions in combination with a radiator. Applicant's prior art Fig. 1 discloses the use of cross-flow charge air cooler units in a heat exchanger package with a radiator, where the charge air cooler manifolds are along the sides of the radiator. Schreiner discloses the use of "a very wide and low radiator assembly" (column 1, line 23), but does not disclose the use of separate upper and lower charge air cooler portions in combination with a radiator.

Claims 26 and 35

Applicant's claims 26 and 35 describe the provision of upper and lower charge air cooler portions overlapping the rear and front of a downflow- or upflow-type radiator. The manifolds of the charge air cooler portions extend across the upper and lower ends of each, and provide for charge air down-flow through the charge air cooler portions (claim 26) or charge air up-flow through the charge air cooler portions (claim 35). The upper end and manifold of the upper charge air cooler portion, where the charge air enters (claim 26) or exits (claim 35), is adjacent the upper end of the radiator, and the lower end and manifold of the lower charge air cooler portion, where the charge air exits (claim 26) or enters (claim 35), is adjacent the lower end of the radiator. The lower end of the upper charge air cooler portion is in line with and opposite the upper end of the lower charge air cooler portion, and a conduit around a side of the radiator, intermediate the radiator ends, connects the respective manifolds of the two charge air cooler portions.

In the method described in claims 26 and 35, the present invention provides the location of the entry and exit for the charge air at the upper and lower ends of the heat exchange package. This gives the advantage that charge air may be connected at the ends of the heat exchanger package, and does not have to be piped in to an intermediate portion. The method also provides for the conduit connection and charge air flow between the two charge air cooler portions between their respective manifolds that are at ends in line with and opposite each other, around a side of the radiator intermediate the radiator ends. This gives the advantage of a short connecting conduit length, so as to minimize pressure drop between the two charge air cooler portions.

Further, in applicant's invention the location of the first charge air cooler receiving the charge air behind the radiator relative to cooling air flow (the upper charge air cooler portion in claim 26; the lower charge air cooler portion in claim 35) and the flow of the coolant through the radiator (down in claim 26; up in claim 35) also means that the engine coolant entering the radiator is exposed initially to the coolest ambient air, before proceeding to the next radiator portion behind the second charge air cooler portion. This provides the best approach differential between the cooling air and engine coolant temperatures in the portion of the radiator first receiving the engine coolant, where proportionally more cooling occurs.

In contrast to applicant's method, EP '288 describes a heat exchanger package and method wherein: 1) the charge air is located at the top of the lower rear cooler 4, necessitating piping the charge air to the midpoint of the heat exchanger package, instead of the end, as in applicant's invention; 2) the charge air connecting line 5 runs from the bottom of the lower rear cooler 4 to the bottom of the upper, front cooler 3, instead of between adjacent manifolds on opposite sides of the radiator, as in applicant's invention. The EPC '288 heat exchanger package and method necessitates a longer piping length than applicant's more direct conduit (between manifolds on ends in line with one another), and necessarily subjects the charge air to a greater pressure drop. This latter difference is particularly crucial since the entire object of the charge air system is to provide the engine intake air at a high pressure. The EP '288 heat exchanger package and method also partially heats the ambient cooling air to a degree before the air passes through the upper portion of the radiator, where the engine coolant first enters. This is opposite to

applicant's invention, and reduces the approach differential between the cooling air and engine coolant temperatures.

Further, EP '288 does not disclose the up-or down-flow arrangement of applicant's charge air cooler portions, and is totally silent as to the manifold placement of coolers 3 and 4. The EP '288 arrangement of coolers 3 and 4 results in both an up-and down-flow of the charge air, whereas applicant's method uses either a consistent down-flow through both charge air cooler portions (claim 26) or a consistent up-flow through both portions (claim 35).

The other cited references, Lambert, Siler and Flessate, as well as applicant's prior art Fig. 1, do not make up for the deficiencies of EP '288. Lambert, Siler and Flessate are single unit charge air coolers, and do not disclose or suggest applicant's arrangement of charge air cooler portions relative to a radiator, and their conduit connection. Prior art Fig. 1 uses cross-flow charge air cooler units, and again does not disclose or suggest applicant's consistent up- or down-flow of charge air through the individual portions and the connecting conduit. Any conclusion of obviousness is based only on a hindsight reconstruction of applicant's invention, based on applicant's own specification and drawings.

Accordingly, applicant submits that the invention of claims 26 and 35 is not obvious to one of ordinary skill in the art from the cited prior art.

Claims 27 and 36

Claims 27 and 36, dependent on claims 26 and 35, respectively, describe a method of cooling engine fluids wherein the dimension between the upper and lower ends of the

charge air cooler portions is less than the dimension from one side of the charge air cooler portions to the other side of the charge air cooler portions, and recites the use of the tubes extending across the shorter dimension of the faces of the charge air cooler portions to carry the charge air between the manifolds. Applicant's claimed method modifies the core style, e.g., the tube geometry, in a non-obvious manner to obtain the desired cooling properties of the claimed charge air cooler portions. As stated in the specification at paragraph 0041:

> Improved heat exchanger package performance, and in particular, improved performance of the charge air cooler units, has been found by utilizing tubes 36 which are as short as possible and as numerous as possible, given the configuration of the charge air cooler unit.

As also mentioned in this paragraph, the core may be further modified by making the tubes two rows deep, or any other configuration. The cited prior art does not suggest this ability to modify core properties such as tube geometry. No such structure and fluid flow is shown or suggested by the combination of EP '288 and Lambert, Siler, Flessate or prior art Fig. 1. The cited Schreiner patent, which discloses only a "very wide and low radiator assembly," does not suggest applicant's charge air cooler proportions and tube arrangement extending across the shorter dimension. Schreiner does not disclose the use of any charge air cooler at all with the disclosed radiator assembly, let alone dimensions or tube arrangement for a charge air cooler. Applicant's ability to modify core properties such as the claimed tube geometry is not suggested by the cited prior art, and no such structure and fluid flow is suggested by the cited combination.

Claims 28 and 37

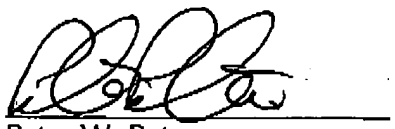
Dependent claims 28 and 37 add to the method of claims 26 and 35, respectively, that the radiator tube extend in the same direction as the fluid-carrying tubes of the charge air cooler portions. Such similar tube direction is not disclosed in the cited art.

Claims 33 and 42

Claims 33 and 42, dependent on claims 26 and 35, respectively, recite in the claimed method that the charge air flow is through conduits around both sides of the radiator, intermediate the radiator ends. Such charge air or fluid flow is not disclosed in EP '288 or the other cited prior art.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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